Short-Radius Lateral Drilling System

Reduces Cost of Horizontal Wells in Mature Fields

Product Developer: *Amoco Production Company*

THE PROBLEM

In many mature oilfields, well over 50% of the original oil-in-place goes unproduced, even when the best EOR techniques are applied. Production problems such as water coning, gas coning, and poor sweep control in waterfloods and miscible floods often prevent achieving recovery factors beyond 30%–50%.

Lateral wellbores drilled from existing wells can solve some of these problems and recover more oil than otherwise possible. Laterals may be used to tap bypassed oil by intersecting fractures, penetrating pay discontinuities, and draining updip traps. Slimhole lateral recompletion strategies can enable a producer to leverage current production facilities, existing wellbores, known oil reserves, and secondary and tertiary recovery technologies.

For lateral re-entries to gain widespread use in older wells, however, producers must be able to drill and complete laterals at a substantial cost reduction over traditional methods for drilling new horizontal wells. Most short radius laterals are drilled using steerable mud motors, which often are too expensive to be economical for re-entries in mature fields.

Another challenge to using laterals in older fields is the ability to drill with air as the circulating medium. Many low pressure reservoirs must be developed with air-drilled wells to prevent fluid loss and formation damage.

THE SOLUTION

Amoco Production Company has developed a reliable, inexpensive slimhole rotary-guided system for drilling re-entry curves and laterals. This short-radius system does not use mud motors, MWD, or steering tools. Downhole assemblies are pre-designed to cut one radius of curvature, and kick-off is achieved from a cement plug instead of a whipstock. A single conductor wireline unit can be used for gyro orientation and running electronic and magnetic surveys. This system is designed for low-cost use on workover rigs.

Amoco tested this system at the RMOTC field testing site, also called NPR-3, to evaluate its air drilling capabilities. Tests conducted on two wells showed that the system can be used to air drill short-radius (90–100 ft) curves and laterals quickly and efficiently and hit planned target zones.

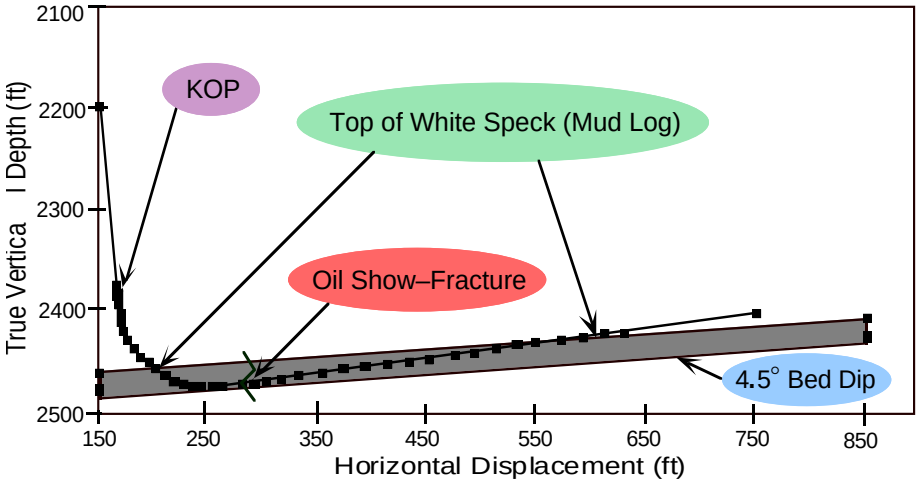
The Amoco short-radius lateral drilling system tested at NPR-3 can help producers increase recovery cost-effectively from existing wells in mature fields.

THE BENEFITS

The Amoco system is a simple short-radius lateral drilling and completion technology that costs significantly less to manufacture and operate than typical mud motor systems. This lateral technology enables producers to drill and complete open-hole laterals from existing wells and produce reserves that would be uneconomical to recover using conventional lateral drilling systems. Producers can use this system with drilling rigs, but they will gain the greatest cost savings by combining it with lower cost workover rigs, equipment, and repair services.

This system has performed successfully in numerous independent field tests Amoco has conducted over a range of lithologies, drilling fluids, radius of curvatures, and drill string configurations. It is the only system of its kind available for drilling with air below 5-1/2 inch casing. Because of the large number of existing wells with this casing size and larger, producers can apply this system in many mature fields worldwide.

The simple design of the downhole assemblies enables on-site maintenance, which can reduce costly standby time. Parts for the system are readily available and typically cost less than parts for conventional short-radius lateral drilling systems.



Vertical section for a Niobrara shale well drilled with the Amoco short-radius system at NPR-3.

THE FIELD PERFORMANCE

The Amoco system was used to successfully air drill laterals of 508 ft and 243 ft in the Niobrara shale and in the Shannon sandstone, respectively. In the Shannon well, the kickoff point was at 222 ft and the radius of curvature was 95 ft. In the Niobrara well, the kickoff point was at 2,364 ft and the radius of curvature was 95 ft. In each well, the lateral drillingwas finished less than four days after curve drilling began.

These RMOTC field tests demonstrated the practicality of using the Amoco system to drill curves and laterals with air in very soft formations and hit planned targets. Both the curves and laterals drilled smoothly with very low drag and torque. The PDC bits used in both wells were jetted for normal mud drilling. Both bits demonstrated good penetration rates with minimal wear.

The RMOTC test also showed that conventional steel drill pipe can be used with this system to efficiently drill short-radius curves with air. Earlier Amoco tests had experimented with using using more costly composite drill pipe.

THE NEXT STEP

The Amoco short-radius lateral drilling technology is commercially available through a number of Amoco -licensed service providers. To find out how you can access a service provider in your part of the world, contact Amoco.

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